



Impacts of Restricted Substance & Environmental Legislation on the Electronics Industry

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Joe Johnson
Cisco Systems, Inc.

A Changing Regulatory Climate

- **The Evolution Of Product-Based Environmental Regulations**
- **Emerging Requirements: Product Materials, Recycling/Disposal & Eco-Design**
- **Industry Approaches to Managing Product-Based Regulations**
- **Restriction of Hazardous Substances: Key Challenges of RoHS Compliance**
- **Summary**



Product-Based Environmental Legislation Is Driving A Revolution In the Electronics Industry!

A Worldwide Regulatory Paradigm Shift: Expanding From Environmental Impacts of Manufacturing Facilities & Operations



To Impacts Of Products



➤ **Product-Based Regulations Are Focused in 3 Areas:**

Elimination/Disclosure Of Environmentally Hazardous Materials

Post-Consumer Recycling & Disposal Of Products

Design-for-Environment To Minimize Impacts Over Entire Product Life-Cycle

Product-Based Environmental Regulations Are Evolving Worldwide

Europe:

RoHS: Restriction Of Hazardous Substances

Bans Use of Lead, Cadmium, Mercury, Hexavalent Chromium, PBB/PBDE Flame Retardants in Electronic Products (July 2006)

WEEE: Waste Electrical & Electronic Equipment

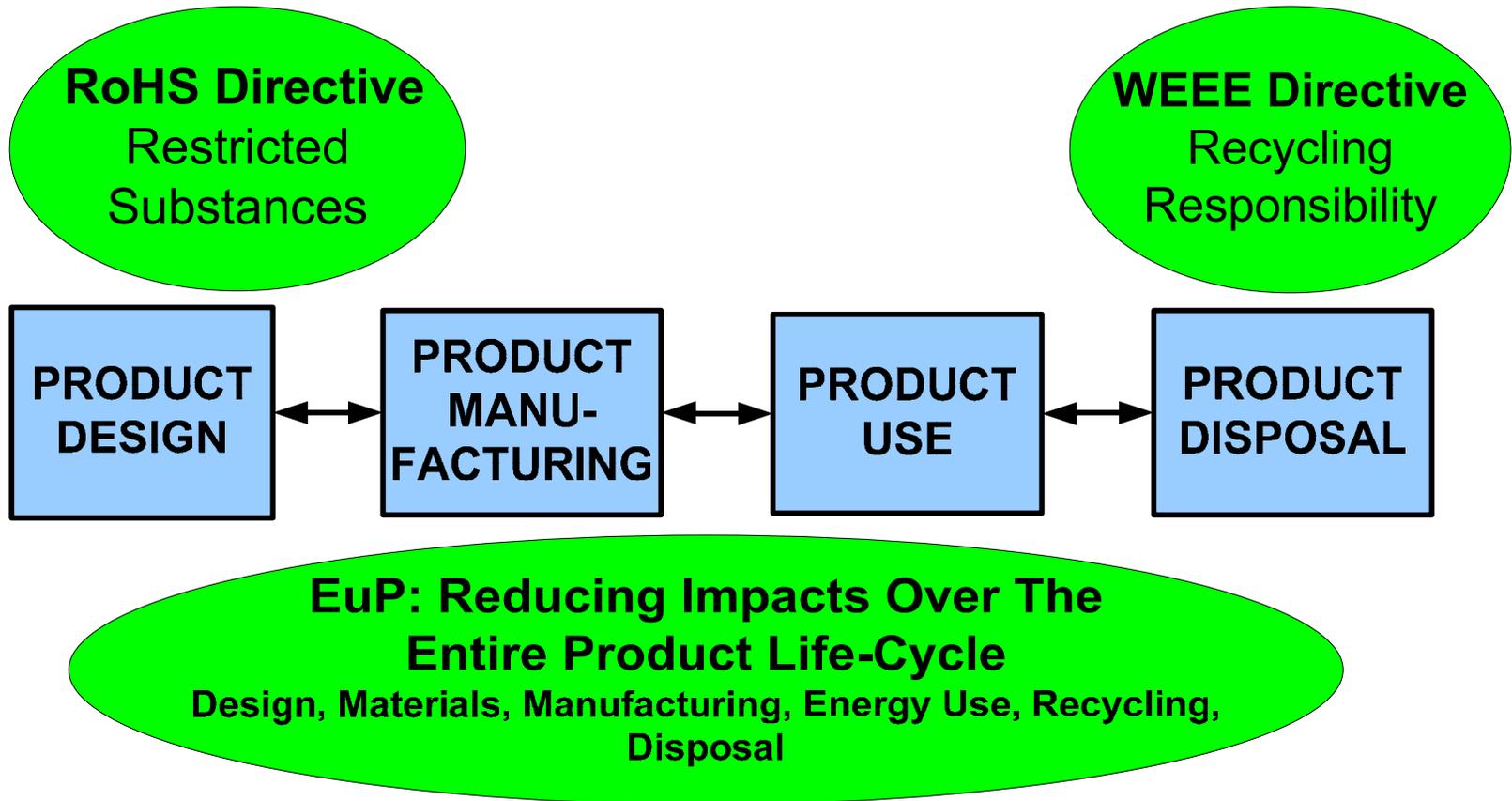
Requires Producers to Manage Post-Consumer Recycling & Disposal of Electronic Products (August 2005)

EuP: Energy Using Products (A 'Framework' Directive) Requires Producers to Design Products To Meet Specific Eco-Design Criteria Over Entire Life-Cycle (~2007 for certain products?)

REACH: Registration, Evaluation and Authorization of Chemicals

Requires Registration & Risk Assessment of Chemical Substances, Possibly Including 'Downstream Use' In Products (~2007?)

Product-Based Environmental Regulations Impact Different Aspects Of The Business/Product Life-Cycle



Bottom Line: Additional Business Resources Will Be Necessary To Manage These New Requirements!

Product-Based Environmental Regulations Are Evolving Worldwide

China:

RoHS: 'Management Methods' Similar to EU RoHS Directive

WEEE: Developing Regulations Parallel To EU WEEE Directive

Energy: New Energy Efficiency Standards for Products

Chemicals: Evaluation In Progress

US:

RoHS: States Restricting Use of RoHS Substances

WEEE: States Enacting or Considering WEEE Laws

Energy: New California Energy Efficiency Standards for Electronic Products

Also Enacted or Evaluating Similar Laws:

Japan, Taiwan, Canada, Mexico, Australia, Korea, Other Countries

Industry Engagement On Worldwide Product-Based Environmental Legislation & Standards

Driving For Harmonized Worldwide Regulations & Standards

- **AEA: American Electronics Association** [www.aeanet.org]
- **EIA: Electronics Industries Alliance** [www.eia.org]
 - **EIATRACK: Worldwide Regulatory Tracking Service** [www.eiatrack.org]
- **EICTA: European Industry Association** [www.eicta.org]
- **JEITA: Japan Electronics & IT Industries Association** [www.jeita.or.jp]
- **iNEMI: International Electronics Manufacturers Initiative** [www.inemi.org]
- **IEC: International Electrotechnical Commission** [www.iec.ch]
 - **Technical Committee 111 Working Group 3: RoHS Test Standard**
- **ASTM International** [www.astm.org]
 - **Committee F40 on Declarable Substances in Materials**

Harmonizing Environmental Market Access Requirements: A Need For Continued Efforts

➤ **A “One World” Approach To Product Qualification**

- Avoid Proliferation Of Differing Regional Compliance Requirements
 - A Harmonized ‘RoHS’ Substances List
 - Joint Industry Guide (JIG) Materials Composition Declaration

➤ **The Challenge: Similar Goals- But Different Approaches**

- Regulatory Basis: Sector, Catalog, Framework, Exposure, Etc.
- Example: EU RoHS vs. China ‘Management Methods’
 - Differences In Scope, Labeling, Compliance Documentation, Exemptions, Testing

➤ **Harmonized Standards Are Win-Win**

- **Efficient For Business**
- **Effective For Meeting Worldwide Compliance Goals**

Typical Approaches to Managing Product-Based Substance Restrictions (RoHS)

- **RoHS Requirements Are Typically Defined Via Specifications & Contract Language Between OEMs & Manufacturers/Suppliers**
- **Additional Requirements May Include:**
 - **Generation Of Compliance Certification Documentation (Via ISO/IEC 17050 “SDoC”, IPC 1752 Or Other Formats)**
 - **Declaration of Certain Non-Regulated Substances**
 - **Compliance ‘Processes’, Auditing & Testing**
- **Currently A Disconnect Between Product Documentation & “Compliance Confidence”**
- **Compliance Violations Are Painful!**
 - **Product Quarantine, Transport, Rework, Scrap, Lost Sales, Man-hours, Legal Action**
 - **Reflects Poorly On Brand/Image & Undercuts Ongoing “Due Diligence”**
 - **Lead/Cadmium In PVC: The Former #1 Risk**
- **RoHS Compliance = A Whole New Ballgame**

Implementing Product-Based Substance Restrictions (RoHS): Key Challenges

RoHS Compliance Challenges:

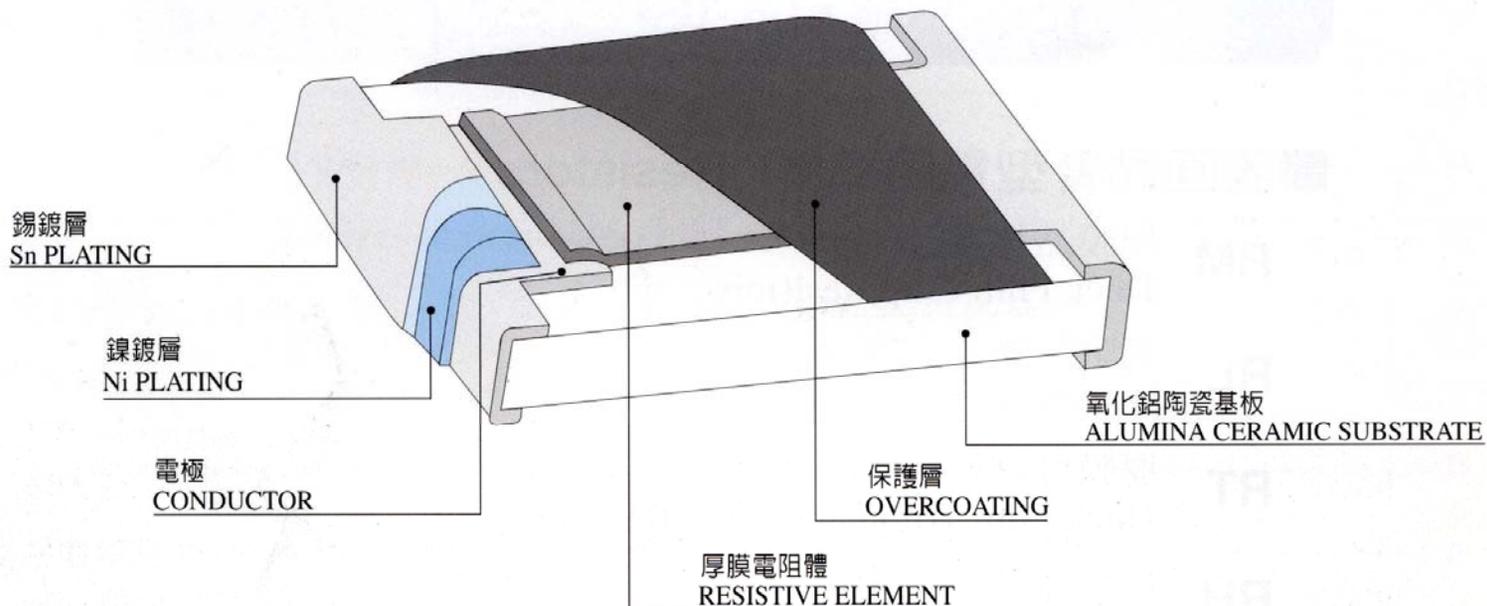
- **Developing Efficient Business Processes To Drive & Document Compliance “Due Diligence” Activity**
 - **The Primary Mechanism For Driving Product Compliance**
- **Developing & Standardizing Effective, Efficient Analytical Test Methods**
 - **Defining The Appropriate Role Of Testing**
- **Defining & Isolating Product Materials For Testing**
 - **Determining Appropriate Interpretation Of Test Results**

Implementing Product-Based Substance Restrictions (RoHS): Key Challenges

The Challenge Of Homogeneous Materials

- RoHS Restrictions Apply At The Material (Not Component) Level
- Each Distinct Material In Every Product Is A Compliance Risk

Solution: (1) Through Understanding Of Component Materials
(2) In-Depth Knowledge Of RoHS Substance Applications



Implementing Product-Based Substance Restrictions (RoHS): Key Challenges

The Challenge Of Effective, Efficient Test Methods

- Different Matrices/Analytes Require Different Analytical Methods

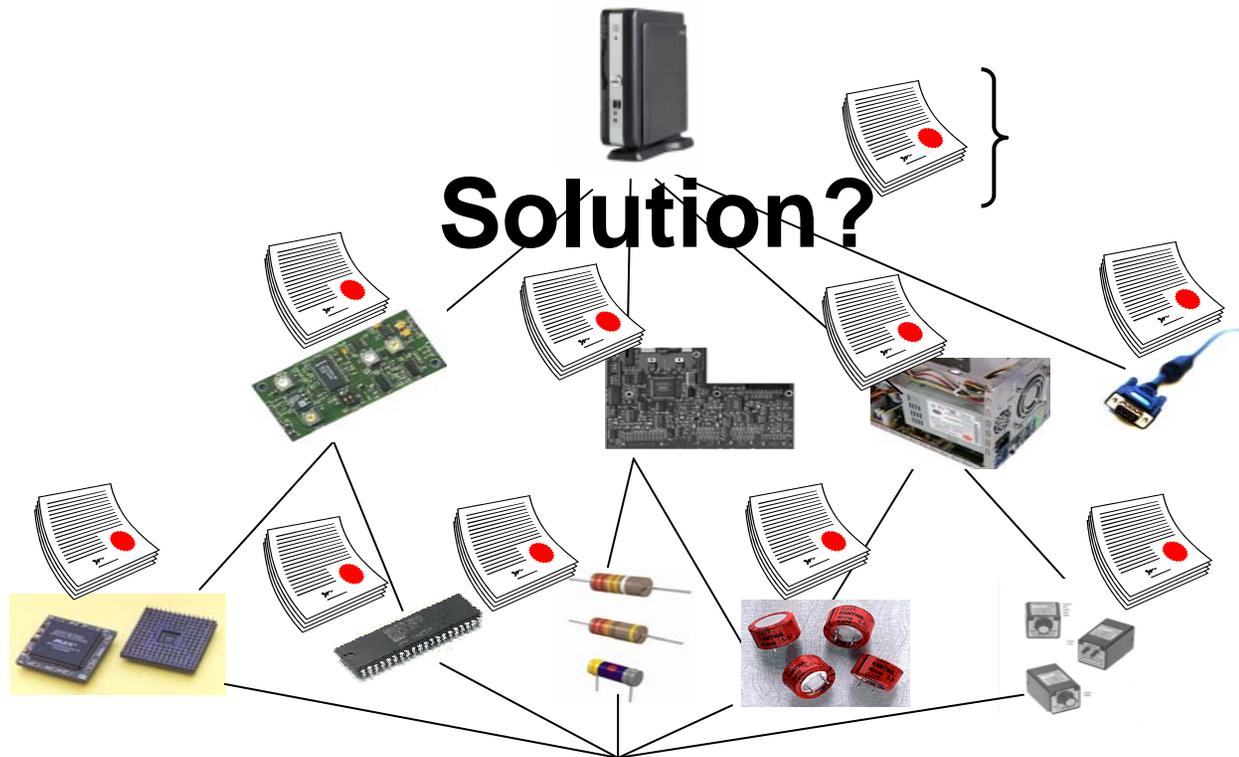
Solution: (1) Adoption Of Harmonized Test Standards & Development Of Certified Reference Materials
(2) Expanded Use Of XRF For Screening-Level Testing

<u>RoHS Substance</u>	<u>Likely RoHS MCV Limits</u>	<u>Typical Test Methods</u>	<u>Wet Chemical Treatment</u>	<u>Typical Equipment</u>
Lead	1000 ppm (<i>300 ppm for cables- CA Prop 65</i>)	Wet chemical, XRF (X-ray Florescence)	Acid digestion	ICP-AES AAS XRF
Cadmium	100 ppm	Wet chemical, XRF	Acid digestion	ICP-AES AAS XRF
Hexavalent Chromium	1000 ppm	Wet chemical, XRF (elemental Cr)	Grinding, Water extract	ICP-AES AAS XRF (elemental Cr)
Mercury	1000 ppm	Wet chemical, XRF	Evaporation, Adsorption	AAS XRF
PBB/PBDE	1000 ppm	GCMS, FTIR, XRF (elemental Br)	Grinding, Solvent extract	GCMS XRF (elemental Br)

Implementing Product-Based Substance Restrictions (RoHS): Key Challenges

The Challenge Of Developing Efficient Business Processes To Drive & Document Compliance “Due Diligence” Activity

- **Entire Extended Supply Chain Is Responsible For Compliance**



Solders, Coatings, Plastics, Glass, Metals, Exemptions, ???

Implementing Product-Based Substance Restrictions (RoHS): Needs/Gaps

- **Promoting Harmonized Worldwide Regulatory Requirements; Obtaining Appropriate Exemptions; Implementing Industry Standards**
- **Developing Cost-efficient Compliance Strategies For Multi-Tiered Global Supply Chains**
- **Generating Compliance Documentation; Qualifying Exemptions; Defining 'Homogeneous Materials'; Optimizing The Role Of Testing**
- **Developing of Certified Reference Materials (CRMs) For Analytical Compliance Testing**
- **Qualification & Testing Of Alternative Materials To Address Existing & Future Restrictions**

In Summary

- **Product-Based Environmental Regulations Are Driving A Revolution In Design, Manufacturing & End-Of-Life Management Of Electronics**
- **Industry Needs Harmonized Worldwide Regulatory Requirements & Standards**
- **RoHS Requires New Understanding of Product Materials & Compliance Risks**
- **Businesses Must Find Efficient Compliance Approaches To Maintain Margins In Extended Supply Chains**



Thank You

Joe Johnson
Cisco Systems, Inc.
joejohn2@cisco.com
(408) 527- 4449

